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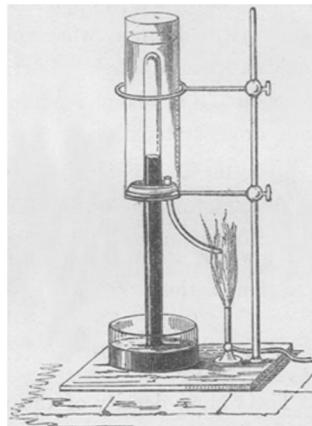
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introduction of anhydrous baryta. Experiment has verified this anticipation.

The upper half of a glass tube filled with, and inverted over, mercury, was surrounded by a second glass tube open at both ends and of a diameter about treble that of the former, the annular space between the two being closed at the bottom of the outer tube by a well-fitting cork. The vessel thus formed round the upper part of the inner tube was moreover provided with a small bent copper tube open at the top and closed at the bottom, which was likewise fixed in the cork. The vessel being filled with paraffin and a lamp being applied to the copper tube, the upper part of the mercury-tube could be conveniently kept at a high and constant temperature, whilst the lower end, immersed in the mercury-trough, remained accessible. A glance at the figure explains the disposition of the apparatus. A small quantity of the hydrated base was then allowed to rise on the top of the mercury in the tube; and the paraffin bath having been heated to 170° , the volume of the vapour was observed. Several pellets of anhydrous baryta were then allowed to ascend into the vapour-volume, while the temperature was maintained constant. The mercury began immediately to rise, becoming stationary again, when a fraction of the vapour had disappeared, which amounted, the necessary corrections being made, to half the original volume.



XI. "Notes of Researches on the Poly-Ammonias."—No. X.

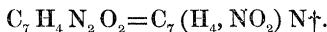
On Sulphamidobenzamine, a new base; and some Remarks upon Ureas and so-called Ureas. By A. W. HOFMANN, LL.D., F.R.S. Received July 24, 1860.

Among the numerous compounds capable of the metamorphosis involved in Zinin's beautiful reaction, the nitriles have hitherto

escaped the attention of chemists. This is the more remarkable, since some of these bodies are easily converted into crystalline nitro-compounds.

When examining several of the diamines which I have lately submitted to the Royal Society*, I was induced to study the transformation which benzonitrile undergoes under the successive influence of nitric acid and reducing agents.

Benzonitrile, when treated with a mixture of sulphuric and fuming nitric acid, furnishes, as is well known, a solid nitro-substitute which crystallizes from alcohol in beautiful white needles, containing



In order to obtain this body, it is desirable to perform the operation with small quantities, and to cool the liquid carefully, otherwise the formation of appreciable proportions of nitrobenzoic acid can scarcely be avoided.

The nitro-compound is readily attacked by an aqueous solution of sulphide of ammonium; sulphur is abundantly precipitated, and on evaporating the liquid, a yellowish red oil is separated, which gradually and imperfectly solidifies. This substance possesses the characters of a weak base, dissolving with facility in acids, and being again precipitated by the addition of ammonia and the alkalies. The preparation in the state of purity, both of the base itself and of its compounds, presents some difficulty. This circumstance has prevented me from analysing the base. I have, however, examined one of its products of decomposition, which leaves no doubt that nitrobenzonitrile, under the influence of reducing agents, undergoes the well-known transformation of nitro-compounds, and that the composition of the oily base is represented by the formula



The oily base, when left in contact with sulphide of ammonium, is gradually changed, a crystalline compound being formed, which is easily soluble in alcohol and in ether, but difficultly soluble in water, and which may be purified by several crystallizations from boiling water, being deposited on cooling in white brilliant needles. This compound is a well-defined organic base; it dissolves with facility in acids, and is precipitated from these solutions by the addition

* Proceedings, vol. x. p. 104.

† H=1; O=16; C=12, &c.

of potassa or of ammonia. With hydrochloric acid it forms a crystallizable salt, which yields, with dichloride of platinum, an orange-yellow crystalline precipitate.

On analysis, the new base was found to have the composition

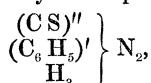


explaining its formation, in which evidently two phases have to be distinguished :

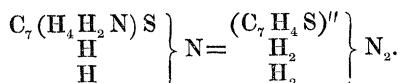
- (1) $\text{C}_7(\text{H}_4\text{NO}_2)\text{N} + 3\text{H}_2\text{S} = 2\text{H}_2\text{O} + 3\text{S} + \text{C}_7\text{H}_8\text{N}_2,$
- (2) $\text{C}_7\text{H}_6\text{N}_2 + \text{H}_2\text{S} = \text{C}_7\text{H}_8\text{N}_2\text{S}.$

The new sulphuretted base has the same composition as sulphoncarbonyl-phenyldiamide, a feebly basic compound which I obtained some time ago by the action of ammonia on sulphonycyanide of phenyl*. $\text{C}_7\text{H}_5\text{NS} + \text{H}_3\text{N} = \text{C}_7\text{H}_8\text{N}_2\text{S}.$

A superficial comparison of the properties of the two bodies shows, however, that they are only isomeric, the constitution of the latter compound being represented by the expression



whilst the constitution of the former may be expressed by the formula

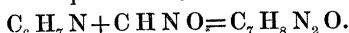


The new sulphuretted base is closely connected with an interesting compound which Chancel obtained some years ago, when he submitted nitrobenzamide to the action of reducing agents. The crystalline base produced in this reaction contains



and differs from the body which forms the subject of this note only by having oxygen in the place of sulphur.

The formation of this oxygenated compound has given rise to some misconceptions, which I take this opportunity to elucidate. A short time before the discovery of the body in question, I had obtained a compound of exactly the same composition by the action of the vapour of cyanic acid upon aniline,

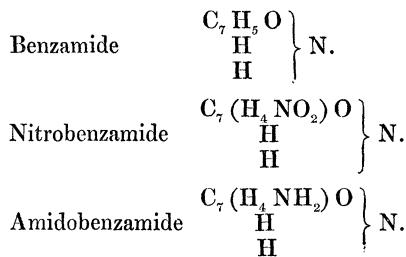


The mode of producing this substance pointed it out as an ana-

* Proceedings, vol. ix. p. 276.

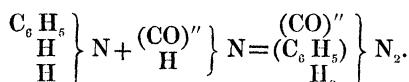
logue of urea, and hence the designation *aniline-urea*, under which I described the new body as the first of the group of compound ureas, which has since been so remarkably enriched by Wurtz and several other chemists.

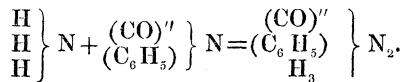
The aniline-urea, or phenyl-urea as it is more appropriately called, differs from ordinary urea in its deportment with acids, being, in fact, no longer capable of producing saline compounds. The absence of basic properties in the new phenyl-compound was sufficient to throw some doubt upon its ureic character, and this doubt appeared to receive additional support by Chancel's subsequent discovery of a compound possessing not only the composition of phenyl-urea, but forming likewise well-defined saline combinations. This compound is, however, the amide of amidobenzoic acid, its constitution being interpreted by Chancel, in accordance with its formation :



Nevertheless chemists, by silent but general consent, began to look upon this compound as the *true* phenyl-urea ; and in most manuals, even Gerhardt's 'Traité de Chimie' not excepted, it figures under this appellation.

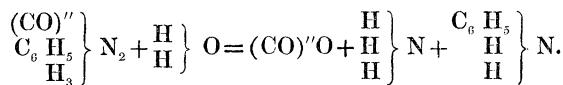
Let us see how far this view is supported by the deportment of this substance. Compound ureas, as I conceive the character of this class, must imitate the deportment of urea *par excellence*, both in their mode of formation and their products of decomposition. Urea is formed whenever cyanic acid or cyanates come in contact with ammonia or ammoniacal salts. These are precisely the conditions under which the substance which I have described as phenyl-urea is generated. This compound is obtained by the union of cyanic acid with phenylamine, or of ammonia with cyanate of phenyl.



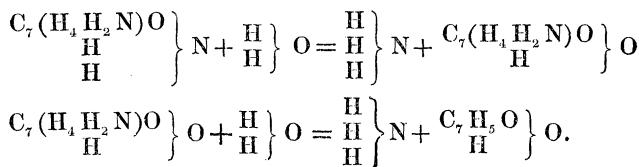


On the other hand, no cyanogen-compound is involved in the formation of amidobenzamide, or amidobenzamine, as it might be more appropriately called, on account of its basic properties.

Not less decisive is the evidence furnished by the products of decomposition of the two bodies. The most characteristic transformation of urea is its decomposition into ammonia and carbonic acid when it is submitted to the action of the alkalies. A compound urea thus treated should yield, together with carbonic acid and ammonia, the monamine from which it has arisen. Phenyl-urea should furnish carbonic acid, ammonia, and phenylamine: these are precisely the products observed in the decomposition of the compound which is formed by the action of cyanic acid on phenylamine.

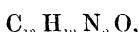


Amidobenzamine, on the other hand, exhibits with potassa the deportment of an amidated amide. The reaction presents two distinct phases, ammonia and amidobenzoic acid being formed in the first phase, and ammonia and benzoic acid in the second:



No trace of carbonic acid and no trace of phenylamine are eliminated by potassa. It is only by fusing with soda-lime that a perfect destruction of the compound ensues, when, as Chancel has distinctly observed, in the first place ammonia, and ultimately carbonic acid and phenylamine are evolved.

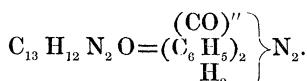
What I have said respecting phenyl-urea applies with equal force to diphenyl-urea. Gerhardt describes as diphenyl-urea the compound obtained by Laurent and Chancel when they examined the action of reducing agents upon nitrobenzophenone, and which, on account of its yellow colour, was originally described as *flavine*. This body contains



which is certainly the formula of diphenyl-urea. But here again chemists have been misled by the basic properties of the substance.

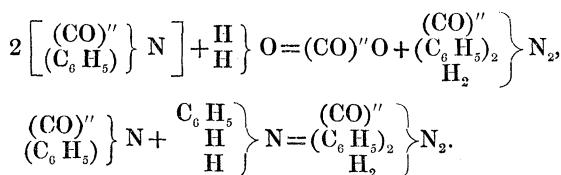
It is not my object at present to dwell on the constitution of flavine, which I intend to examine in a subsequent note; suffice it to say that this substance is not diphenyl-urea.

The true diphenyl-urea is the substance commonly called carbamide, or carbophenylamide.

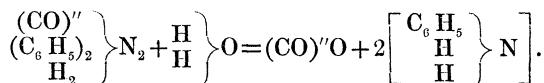


Both the conditions under which this body forms, and the products into which it is decomposed, leave no doubt regarding its position in the system.

This compound is formed by the action of cyanate of phenyl upon either water or phenylamine.



When boiled with potassa, it splits into carbonic acid and phenylamine.



These are the characters of *true* diphenyl-urea.

XII. "Researches on the Phosphorus-Bases." — No. VIII.

Oxide of Triethylphosphine. By A. W. HOFMANN, LL.D., F.R.S. Received July 24, 1860.

In our former experiments *, Cahours and myself had often observed this substance, but we did not succeed in obtaining it in a state of purity fit for analysis. Nevertheless, founding our conclusion on the composition of the corresponding sulphur-compound, and having regard to the analogies presented by the corresponding

* Phil. Trans. 1857, p. 575.